Curriculum Vitae

Last updated: 21. July. 2023

Personal Information

- Name: Satoya Imai
- Birth date and location:
- Nationality:
- Languages:
- Work address:
- Email:
- Skype:
- Telephone:

Education

- November 2019 - present (plan to finish in September), Ph.D. in Physics
  Department of Physics, University of Siegen, Germany
  Supervisor: Prof. Dr. Otfried Gühne
- April 2017 - March 2019, Master of Science in Engineering
  Department of Physical Engineering, Mie University, Japan
  Supervisor: Prof. Dr. Sumiyoshi Abe
  Thesis: Effects of Entanglement on Vortex Dynamics in Madelung's Hydrodynamic Representation
- April 2013 - March 2017, Bachelor of Science in Engineering
  Department of Physical Engineering, Mie University, Japan
  Supervisor: Prof. Dr. Sumiyoshi Abe
  Thesis: Hydrodynamic Representation of Quantum Mechanics

Long-Term Research Visits

- October 2022 - December 2022,
  Research Visit at the University of the Basque Country, Spain (group lead by Géza Tóth)
- December 2017 - February 2018,
  Study Visit at the Huaqiao University, China

Teaching Experiences

- April 2022 - July 2022, Tutor of Exercise class, University of Siegen, Germany
  Course name: Quantum Information Theory
  Lecturer: PD. Dr. Matthias Kleinmann
- April 2018 - August 2018, Graduate Teaching Assistant, Mie University, Japan
  Course name: Physical Mathematics (Introduction of mathematical techniques for physics)
  Lecturer: Prof. Dr. Sumiyoshi Abe
- April 2017 - August 2017, Graduate Teaching Assistant, Mie University, Japan
  Course name: Physical Mathematics (Introduction of mathematical techniques for physics)
  Lecturer: Prof. Dr. Sumiyoshi Abe

Supervising Students

- June 2021 - September 2021: Shravan Shravan, DAAD Internship student from the School of Physics, IISER Thiruvananthapuram, India
  Project name: Decoherence effects on sector lengths

Grants

- October 2021 - present, Ph.D. grant, from Der Deutsche Akademische Austauschdienst (DAAD).
  (Maximally I am allowed to use around 60000 Euro in total)

Referee for:

- **Journals:** Quantum (1)/ New Journal of Physics (1)/ Annalen der Physik (1)/ European Physical Journal Plus (1)
- **Conferences:** TQC (Theory of Quantum Computation, Communication and Cryptography) (1)

Preprints

1. B. Yadin, S. Imai, and O. Gühne,
   Quantum speed limit for perturbed open systems,
   arXiv:2307.09118

2. C. Zhang, Y.-Y. Zhao, N. Wyderka, S. Imai, A. Ketterer, N.-N. Wang, K. Xu, K. Li, B.-H. Liu, Y.-F. Huang, C.-F. Li, G.-C. Guo, and O. Gühne,
   Experimental verification of bound and multiparticle entanglement with the randomized measurement toolbox,
   arXiv:2307.04382

3. P. Cieśliński*, S. Imai*, J. Dziewior, O. Gühne, L. Knips, W. Laskowski, J. Meinecke, T. Paterek, and T. Vértesi,
   Analysing quantum systems with randomised measurements,
   arXiv:2307.01251,
   *These authors contributed equally as co-first authors.

4. N. Wyderka, A. Ketterer, S. Imai, J. L. Bönsel, D. E. Jones, B. T. Kirby, X.-D. Yu, and O. Gühne,
   Complete characterization of quantum correlations by randomized measurements,
   arXiv:2212.07894

Refereed Articles in Journals

1. Z.-P. Xu, S. Imai, and O. Gühne,
   Fate of multiparticle entanglement when one particle becomes classical,
   Phys. Rev. A 107, L040401 (2023); arXiv:2206.12834
   DOI: https://doi.org/10.1103/PhysRevA.107.L040401

2. S. Imai, O. Gühne, and S. Nimmrichter,
   Work fluctuations and entanglement in quantum batteries,
   Phys. Rev. A 107, 022215 (2023); arXiv:2205.08447
   DOI: https://doi.org/10.1103/PhysRevA.107.022215

3. A. Ketterer, S. Imai, N. Wyderka, and O. Gühne,
   Statistically significant tests of multiparticle quantum correlations based on randomized measurements,
   Phys. Rev. A 106, L010402 (2022); arXiv:2012.12176
   DOI: https://doi.org/10.1103/PhysRevA.106.L010402

4. X.-D. Yu, S. Imai, and O. Gühne,
   Optimal entanglement certification from moments of the partial transpose,
   Phys. Rev. Lett. 127, 060504 (2021); arXiv:2103.06897
   DOI: https://doi.org/10.1103/PhysRevLett.127.060504

5. S. Imai, N. Wyderka, A. Ketterer, and O. Gühne,
   Bound entanglement from randomized measurements,
   Phys. Rev. Lett. 126, 150501 (2021); arXiv:2010.08372
   DOI: https://doi.org/10.1103/PhysRevLett.126.150501

6. S. Imai,
   Effects of entanglement on vortex dynamics in the hydrodynamic representation of quantum mechanics,
   Int. J. Quantum Inf. 18, 2050030 (2020); arXiv:1902.08400
   DOI: https://doi.org/10.1142/S0219749920500306

Conference Talks

1. *Quantum metrology from randomized measurements*,
   Conference of the German Physical Society,
   Hannover in Germany, 5-10 March 2023.

2. *Quantum Entanglement: Detection and Characterization*,
   The 7th physics and applied physics seminar in Germany for Japanese researchers,
   Potsdam in Germany, 24 February 2023.

3. *Entanglement detection from randomized measurements*,
   Quantum Correlations of Nature (Quantum Corona),
   Siegen in Germany, 26-29 September 2022.

4. *Work fluctuations and entanglement in quantum batteries*,
   Conference of the German Physical Society,
   Regensburg in Germany, 4-9 September 2022.

5. *High-dimensional entanglement and work fluctuations in composite quantum systems*,
   Spring Workshop on Quantum Thermodynamics,
   Siegen in Germany, 28-30 March 2022.

6. *Entanglement and work fluctuations in composite quantum systems*,
   (online) Conference of the German Physical Society,
   Germany, 20-24 September 2021.

7. (canceled) *Multiparticle entanglement detection on sector lengths*,
   Conference of the German Physical Society,
   Hannover in Germany, 8-13 March 2020.

Seminar Talks

1. *Quantum correlations from randomized measurements*,
   INO-CNR, LENS,
   Florence in Italy, 28 April 2023.

2. *Work fluctuations and entanglement in quantum batteries*,
   Anhui University,
   Hefei in China, 3 March 2023.

3. *Entanglement detection from randomized measurements*,
   Heinrich Heine University Düsseldorf,
   Düsseldorf in Germany, 2 Feburary 2023.

4. *Geometry of quantum entangled states*,
   University Charles III of Madrid,
   Madrid in Spain, 25 November 2022.

5. *Entanglement detection from randomized measurements*,
   The University of the Basque Country - UPV/EHU,
   Bilbao in Spain, 16 November 2022.

6. *Characterizing Entanglement with Randomized Measurements*,
   The University of Tokyo,
   Tokyo in Japan, 25 January 2022.

Posters

1. *Work fluctuations and entanglement in quantum batteries*,
   Quantum Measurement Theory: Foundations and Applications,
   Physikzentrum Bad Honnef in Germany, July 2022.

2. *Role of entanglement on vortex dynamics in the hydrodynamic representation of quantum mechanics*,
   Okinawa Summer School in Physics on Coherent Quantum Dynamics,
   Okinawa in Japan, September 2018.

3. *Role of entanglement on vortex-vortex dynamics in the hydrodynamic representation: Time-dependent variational principle*,
   18th Asian Quantum Information Science Conference,
   Nagoya in Japan, September 2018.

4. *Dynamics of vortex-vortex interaction in the Madelung fluid: Variational approach*,
International Graduate Symposium,
Mie in Japan, November 2017.

Talks in Siegen

- **arXiv review in the group seminar, where one person gives a talk to the members once a week**

1. *Fundamental Limitation on the Detectability of Entanglement*,
PRL 129, 230503 (2022), December 2022.
2. *Multicopy metrology with many-particle quantum states*,
2203.05538, May 2022.
3. *Uncertainty relations with the variance and the quantum Fisher information based on convex decompositions of density matrices*,
2109.06893, October 2021.
4. *Efficient nonlinear witnessing of non-abosolutely separable states with lossy detectors*,
2105.06394, May 2021.
5. *Entropic uncertainty relations for SIC-POVMs and MUMs*,
2011.00808, November 2020.
6. *Mixed-state entanglement from local randomized measurements*,
2007.06305, August 2020.
7. *On the Alberti-Uhlmann condition for unital channels*,
2003.07889, April 2020.
8. *Quantumness of channels*,
1911.07677, November 2019.

- **other presentations**

1. *Bose Einstein Condensations*, Seminars of Theoretical Physics, June 2023.
2. *All You Need Is Randomized Measurement*, Quantum Optics Seminar, April 2023.
3. *Dynamical Decoupling*, Group retreat at Winterberg, February 2023.
4. *Jones Polynomial*, Seminars of Theoretical Physics, June 2022.
5. *Quantum Metrology*, Tutorials of quantum information, March 2022.
6. *Randomized Measurements*, Quantum Optics Seminar, November 2020.
7. *Linear regression*, Group retreat at Cochem, October 2020.
8. *Quantum Otto Engine*, Lecture of quantum thermodynamics, June 2020.

Technical Strengths

- LaTex, Mathematica, Office

Bibliographic databases

- Google Scholar: `https://scholar.google.com/citations?user=rCJLegwAAAAJ&hl=en`
- arXiv: `https://arxiv.org/a/imai_s_1.html`
- ORCID: `https://orcid.org/0000-0003-0083-7743`